

Supplementary Results

Supplementary table 1 – List of experimentally identified phospho-peptides. Mass-spectrometry derived phosphopeptides are described in accompanying spreadsheet.

Supplementary table 2 – Kinase models tested. 10 kinases were selected for predictions based on their functional associations with the cell cycle, the availability of a kinase specificity model in the Group Based Prediction system (<http://gps.biocuckoo.org/>) and at least 30 known kinase-site interactions described in the PhosphositePlus database (<http://phosphosite.org>). For each kinase we tested the capacity of the model to discriminate between the known targets and other phosphosites known to be regulated by protein kinases. AROC – area under the receiver operating characteristic curve. Pos – number of positive kinase-site interactions scored. Neg – Number of negative kinase-site interactions scored. The model for CDK7 was excluded from further analysis given its relatively low prediction accuracy.

Kinase model	Human protein id	AROC	Pos	Neg
All	all	0.86	1081	22319
AGCAKT	ENSP00000270202	0.94	110	2230
Atypical/PIKK/ATR	ENSP00000343741	0.94	46	2294
CAMK/CAMKL/CHK1	ENSP00000278916	0.74	29	2311
CMGC/CDK/CDC2/CDC2	ENSP00000378699	0.85	230	2110
CMGC/CDK/CDC2/CDK2	ENSP00000266970	0.81	379	1961
CMGC/CDK/CDK5	ENSP00000297518	0.8	34	2306
CMGC/CDK/CDK7	ENSP00000256443	0.63	31	2309
Other/AUR/AUR-A	ENSP00000216911	0.82	36	2304
Other/AUR/AUR-B	ENSP00000313950	0.87	102	2238
Other/PLK/PLK1	ENSP00000300093	0.78	84	2256

Supplementary table 3 – List of predicted kinase interactions conserved in 4 or more species. Cell cycle regulated: human protein known to have phosphosites that are regulated during the cycle (1 – yes; 0 – no). Mitochek pheno: human gene known to cause a mitotic phenotype as described in the Mitochek database (1 – yes; 0 – no); TP - Known human kinase-substrate interaction as described in the PhosphositePlus database (1 – yes; 0 – no). Conservation: Number of species with a conserved predicted kinase-protein interaction.

Kinase	Phosphoprotein	Putative human homolog gene name	Cell cycle regulated	Mitochek pheno.	TP	Conservation
Chk1	XL_00250003	TRIP12	1	1	0	4
Chk1	XL_00152649	RPS6	1	0	0	4
Chk1	XL_00214244	RPS6	1	0	0	4
Chk1	XL_00088845	PI4KB	1	1	0	5
Chk1	XL_00209783	CHERP	0	1	0	4
Chk1	XL_00148955		1	0	0	5
Cdk5	XL_00238511	RAPTOR	1	0	0	4
Cdk5	XL_00123726	RANBP2	1	1	0	4
Cdk5	XL_00011429	RANBP2	1	1	0	4
Cdk5	XL_00108623	PDCD4	1	0	0	4
Cdk5	XL_00203506	PDCD4	1	0	0	4
Cdk5	XL_00288254	PBRM1	1	0	0	5
Cdk5	XL_00164291	ORC2	1	0	0	5

Cdk5	XL_00238048		0	1	0	4
Cdk5	XL_00037180		0	1	0	4
Cdk2	XL_00129662	UNG	0	0	1	4
Cdk2	XL_00089193	SMARCC1	1	0	0	5
Cdk2	XL_00277462	SEC61B	1	0	0	4
Cdk2	XL_00238511	RAPTOR	1	0	0	5
Cdk2	XL_00244493	RAD23B	0	1	0	4
Cdk2	XL_00108623	PDCD4	1	0	0	4
Cdk2	XL_00203506	PDCD4	1	0	0	4
Cdk2	XL_00164291	ORC2	1	0	1	4
Cdk2	XL_00007232	MCM2	1	0	1	5
Cdk2	XL_00220553	LIG1	0	0	1	5
Cdk2	XL_00204103	G3BP2	0	0	0	4
Cdk2	XL_00120267	CDC6	0	1	1	4
Cdk2	XL_00100020	ANLN	1	1	0	4
Cdk2	XL_00248230		0	0	0	4
Cdk2	XL_00113146		0	0	0	4
Cdk2	XL_00243487		0	0	1	4
Cdk2	XL_00212491		0	0	0	6
Cdc2	XL_00089193	SMARCC1	1	0	0	5
Cdc2	XL_00277462	SEC61B	1	0	0	4
Cdc2	XL_00244493	RAD23B	0	1	0	4
Cdc2	XL_00124210	NUP98	1	0	0	4
Cdc2	XL_00069300	NUP98	1	0	0	4
Cdc2	XL_00220553	LIG1	0	0	1	5
Cdc2	XL_00120267	CDC6	0	1	0	4
Cdc2	XL_00214052	CARHSP1	1	0	1	4
Cdc2	XL_00120818	CARHSP1	1	0	1	4
Cdc2	XL_00206425		0	0	0	5
Cdc2	XL_00234776		0	0	0	5
Aur-B	XL_00152649	RPS6	1	0	0	5
Aur-B	XL_00214244	RPS6	1	0	0	5
Aur-B	XL_00232516	PRKAR2A	1	0	0	5
Aur-B	XL_00131108	CLASP1	1	1	0	5
Aur-B	XL_00194512	CLASP1	1	1	0	4
Atr	XL_00157535	CCT3	0	0	0	6
Akt	XL_00044304	YTHDC1	1	0	0	4
Akt	XL_00250003	TRIP12	1	1	0	4
Akt	XL_00152649	RPS6	1	0	0	4
Akt	XL_00214244	RPS6	1	0	0	4
Akt	XL_00108623	PDCD4	1	0	1	4
Akt	XL_00194512	CLASP1	1	1	0	4
Akt	XL_00131108	CLASP1	1	1	0	4
Akt	XL_00209783	CHERP	0	1	0	4
Akt	XL_00214052	CARHSP1	1	0	1	4
Akt	XL_00120818	CARHSP1	1	0	1	4
Akt	XL_00212491		0	0	0	6